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ORIGINAL ARTICLE

Role of Injury Severity Score in prediction of morbidity, survival and mortality following Road Traffic Accidents

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Abstract

Background: Patients with trauma who land in the emergency room are a crucial. They need emergency care at priority Evaluation of such patients then becomes necessary and crucial in terms of their morbidity, Survival and mortality. From relatives of patients to caregivers, are interested in knowing the prognosis of such patients. And then there becomes a need to develop a method which has predictive value to tell the prognosis. The **Injury Severity Score** (**ISS**) is an established medical score to assess trauma severity.[8] It correlates with mortality, morbidity, and hospitalization time after trauma. It is used to define the term major trauma. A major trauma (or polytrauma) is defined as the Injury Severity Score being greater than 15.[2] The ISS is based upon the Abbreviated Injury scale (AIS). To calculate an ISS for an injured person, the body is divided into six ISS body regions. These body regions are: Head or neck – including cervical spine, Face – including the facial skeleton, nose, mouth, eyes and ears, Chest – thoracic spine and diaphragm, Abdomen or pelvic contents – abdominal organs and lumbar spine, Extremities or pelvic girdle – pelvic skeleton, External

To calculate an ISS, we take the highest AIS severity code in each of the three most severely injured ISS body regions, square each AIS code and add the three squared numbers for an ISS = $A^2 + B^2 + C^2$ where A, B, C are the AIS scores of the three most injured ISS body regions). The ISS scores range from 1 to 75 (i.e. AIS scores of 5 for each category). If any of the three scores is a 6, the score is automatically set at 75. Since a score of 6 ("Dying") indicates the futility of further medical care in preserving life, this may mean a cessation of further care in triage for a patient with a score of 6 in any category.
Anatomically well-designed, the Injury Severity Score (ISS) is a standard method used to assess trauma victims after road traffic accidents (RTAs). In terms of damage severity, this scale does aid in quantifying the probability of survival by taking into account anatomical, physiological, and age parameters. This study set out to evaluate the predictive significance of injury severity score with respect to patient morbidity, mortality, and length of hospital stay after motor vehicle accidents.

Material and Methods:
A study prospective cohort in structural design was conducted upon a total of 144 trauma patients of both genders who were admitted in emergency department of Rama Medical College Hospital

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and Research Centre, Mandhana Kanpur, with selection criteria being specific to the study and is easily recruitable. The study was conducted from January 2022 to December 2023. Full informed written consent was obtained from such patients for their inclusion in the study.
Upon arrival, the patients were evaluated based on the injury severity score, and the score was noted. On a self-structured questionnaire, basic biographical information, sociodemographic information, and specifics of the traffic accidents and resulting trauma were also recorded.
R**esults**: Among the 150 RTA patients enrolled within the study, a total of 144 patients completed the study and were evaluated for the results. Approximate ratio of male and female was around 78% males. And 22% females. The demographics included were age (29±6). The injury severity score obtained preliminarily was 42±5 and average hospital stay was 4±1 days. The overall mortality rate as descripted by the data tends to be 31%.
Conclusion: The results demonstrated a strong correlation between the injury severity score and mortality, duration of hospital stay and the outcome was stratified to coincide with three distinct score ranges of the injury severity score.
Keywords: Injury Severity Score, morbidity, mortality, triage, Road traffic accident

Introduction:
Road traffic Injuries are on rise and posing as a significant public health issue. With development and rise of road traffic, Road traffic accidents are on rise. Additionally, they are expected to be among the most difficult challenges, and in general. The health care systems are ill-prepared to meet this challenge. Injuries kill the primary breadwinner, ruin the family unit as a whole, and wreak havoc on entire towns. In addition to the financial burden, many patients experience physical disabilities and lifelong hardships.[1]
An estimate of motor vehicle injuries worldwide indicates that approximately 10 million people are impacted each year. Road traffic accidents (RTAs) are the primary cause of mortality for teenagers and young adults and are also the most common cause of preventable fatalities.[2]

With over 3,000 deaths every day, there are almost 1.28 million deaths annually. The tragedy doesn't end here, as millions more people suffer non-fatal injuries that result in physical impairments. Ninety percent of accident-related fatalities take place in underdeveloped nations.[3]
Interestingly, 45% of accidental deaths globally occur of pedestrians, two-wheelers (cyclists and motorized riders), and their pillion riders. These are the most vulnerable and "most at risk" commuters.[4]
This clearly demonstrates that information gaps, scarce resources, the lack of accurate assessments of the existing injury burden, and conventional narrow perspectives on illnesses and healthcare have all contributing ineffective management of traffic accidents in developing nations.[2,5]
Quantitative calculations of the degree of injury have always been necessary to evaluate the social costs associated with accidents, the relative effectiveness of injury prevention measures, and the advantages of different treatment modalities.[5]

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Patients suffering from burns already have access to a very similar variable. These injuries provide easy access to direct measurement because they are surface injuries. Percentage of Total burn surface Area (TBSA) is linearly correlated with death.[6]

A comparative quantification of severity of Road Traffic Accidents is also required to predict the prognosis of such patients. This criterion is satisfied by the Injury Severity Score. The Abbreviated Injury Scale (AIS), an anatomical injury severity categorization system, serves as the foundation for the Injury Severity Score, which evaluates the cumulative consequences of polytrauma in patients.[7]

The Injury Severity Score is a widely used scoring system that has good correlations with various severity measurements in terms of mortality, and morbidity and survival.[8]

our study aims to assess the predictive value of the injury severity score with regard to hospital stays, mortality, and morbidity and survival among patients of traffic accidents.

Material and Methods:

This prospective cohort recruited 150 trauma patients brought to emergency department, among which 144 patients completed the study, were chosen through purposive sampling. The patients included were individuals from both genders, above 18 years in age, admitted in the emergency department of Rama Medical College Hospital and Research Centre, Mandhana, Kanpur, with road traffic accidents. The study duration was between 1st January 2022 to 31st December 2023. An essential tool for determining the extent of damage is the injury severity score, which also aids in accurately and completely documenting the injuries [9]. Our research aimed to ascertain the prognostic validity of injury severity scores and their correlation with hospital stays, morbidity, and mortality in traumatized individuals.

The patients were assessed using the injury severity scores upon arrival, and the score was recorded, Written Informed consent was taken. Every patient was allowed to leave the study at any time, for any reason, and without having to sign a consent form. A self-structured questionnaire was also used to record basic biographical information, sociodemographic information, and specifics of the resulting trauma and traffic accident.

Data analysis was done with SPSS 22.0. The highest shortened injury scale code in each of the three body regions with the highest injury severity scores was added up to determine the overall injury severity score. Additionally, if specifics are not provided, it would be fair to use the following example: if a patient had a fracture of the lower end of the radius, his shortened injury scale would be 2, but if it was known to be displaced or open, it would be 3. The lesser score is applied if it is not given [11]. The range of Injury Severity Scores is 1 to 75. The injury severity score is automatically awarded 75 if an injury is determined to be incurable at this time by the jury.

Results: Among the 144 patients enrolled into the study there were about 78% males and rest 22% females in the study. The mean age of sample stood 29 specified as (29 ± 6). Every injury described encompasses all affected anatomical regions. Head trauma was the second most common injury, with a cumulative incidence of 19.4% and a skull fracture of 9.72%, among other injuries like concussions, hematomas, and diffuse axonal injury. The most prevalent injuries were fractures to the limbs (legs: 30.55%, arms: 23.61%). The overall mean injury severity score was obtained was 46.3 ± 7. The overall mean hospital stay was 6 days (6 ± 0.5).

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The mortality rate stood at 13.53%. The data were sorted to correspond with the three distinct injury severity score ranges, and they produced very significant findings, leading to conclusions and further establishing the injury severity score as a mortality predictor.

Table 1: Age wise gender distribution of patients

Age group (years)	Male	Female	Total
≤ 20	14	2	16
21 – 25	24	4	28
26 – 30	52	12	64
31 – 35	14	6	20
36 – 40	4	4	8
≥ 41	4	4	8
	112	32	144

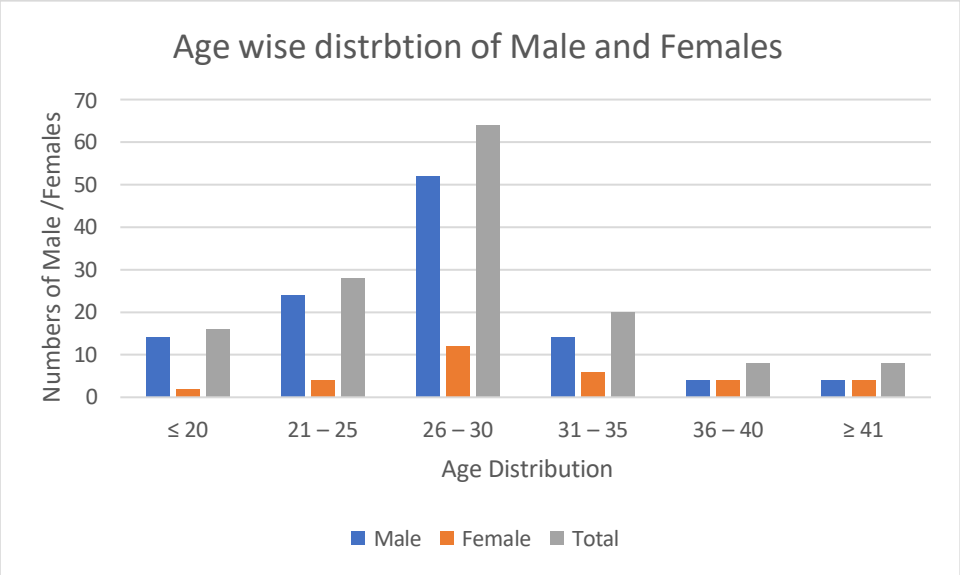

Figure 1- Number of Male/Females participants belonging to specific age groups.

Table 2: Percentage Mortality and Hospital Stay in different age groups

Age Group	Mortality Rate	No. of Hospital Days
BELOW 20	18	3
26-30	12	4
31-35	13	4
36-40	10	8
ABOVE 41	16	10

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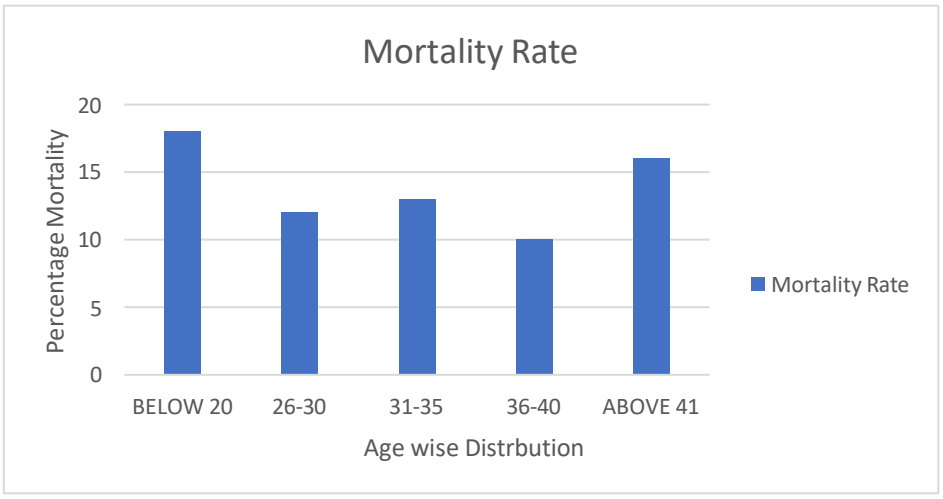

Figure 2: Percentage Mortality amongst different age groups

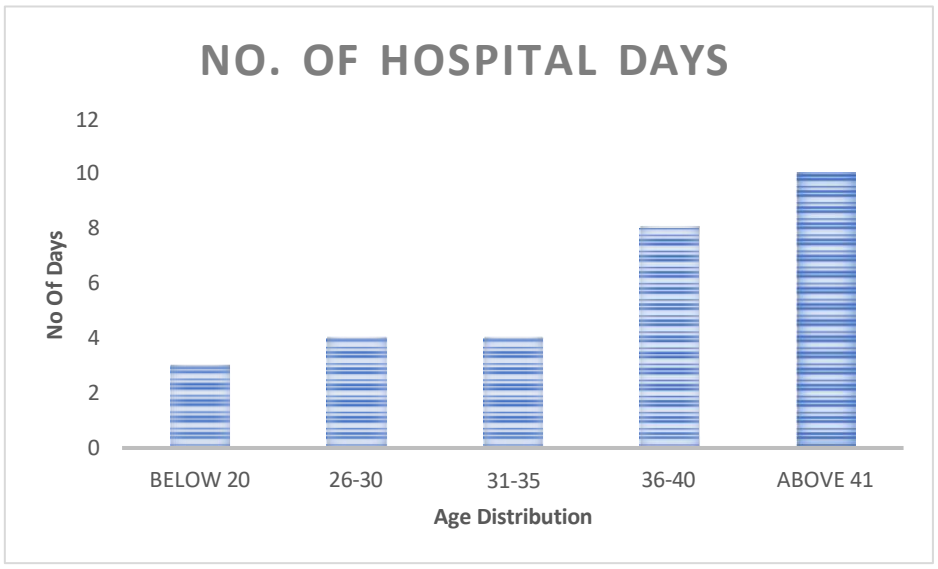

Figure 3: Age wise Number of hospital days spent by participants

Discussion:

The clinical severity, mortality, time to death, and length of hospital stay[12] are all closely correlated with the injury severity scores values of this set of traffic accidents.[13] However, it is important to note that the term "severity" needs to be defined in greater detail. All patients in our settings are deemed severely damaged if their anatomical description of injury severity score is greater than or equal to 16.[14] Because the fatality statistics closely match those previously published by Baker et al., they appear to be more interesting and are therefore more practically useful and valid in a variety of emergency scenarios around the world.

Treatment durations and disabilities also shown a high statistical correlation with the values of the injury severity score, however it is obvious that this is addressing groups rather than specific individuals.[15] Therefore, it follows that this injury severity score rating cannot be used to predict with any degree of accuracy the length of a patient's therapy or the resulting impairment.[16] It is possible to estimate the expected average result for a set of cases with comparable scores.[17] However, there is a chance that independent research on treatment

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durations would be needed to determine the standards for various healthcare systems. The usage of logarithmic time units should be taken into account if such forecasts are to be created since they appear to offer certain statistical benefits.[18]

Despite being a clearly effective way to gauge severity, there may still be room for improvement with the injury severity score index.[19] One limitation is that a patient might only have one "area" injury, but it could be extremely severe—for example, a rupture of the great vessels or a decapitation.[20]

The maximum injury severity score rating for these types of injuries is 25, and the combination of three moderate (A.I.S.) injuries in three different places would exceed this number, providing an injury severity score rating of 27.[21] This combination would undoubtedly result in a deadly outcome. Enhancement could potentially be achieved by broadening the range, allowing the more severe injury severity score values to be subdivided into smaller ranges.[22]

Conclusion:

The results showed substantial associations when the outcome was stratified to match with three distinct injury severity score ranges, confirming the use of injury severity score as a mortality predictor.

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Conflict of interest: None

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Ethical Issues: Ethical Clearance from Institutional ethical committee of the Institute was taken before the conduct of study

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